# Theoretical Division Nuclear Weapons Program Highlights 2004–2005

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## *Preface*

Theoretical (T) Division plays an important role in the Nuclear Weapons Program at Los Alamos, providing a significant amount of the underlying theoretical and modeling capability in the areas of dynamic materials response and equation of state, nuclear and atomic physics, plasma physics, fluid mechanics, and computational methods for the Laboratory. These capabilities are brought to bear, in collaboration with our colleagues elsewhere in the Laboratory, on the increasingly challenging problems arising from the Stockpile Stewardship Program. In order to validate a truly predictive simulation capability, the fidelity of the underlying physics descriptions must continue to improve, and this requires the development and implementation of more sophisticated physics models into the simulation codes in a close partnership with our experimental, modeling, and simulation capabilities.

Researchers in T Division work with theoretical colleagues in other divisions and with coworkers in experimental divisions to produce models of physical behavior. These models ultimately are expressed in continuum form but draw from subscale modeling and theory to best capture those macroscopic effects that are driven by phenomena at atomic or mesoscales. These models are validated by fundamental scientific data, parameterized, and implemented into codes, to be further tested against evermore complex integral experiments. The improved capability resulting from these newer-generation physics models is making significant differences in our ability to fulfill our stockpile stewardship responsibilities.

Paul J. Dotson
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